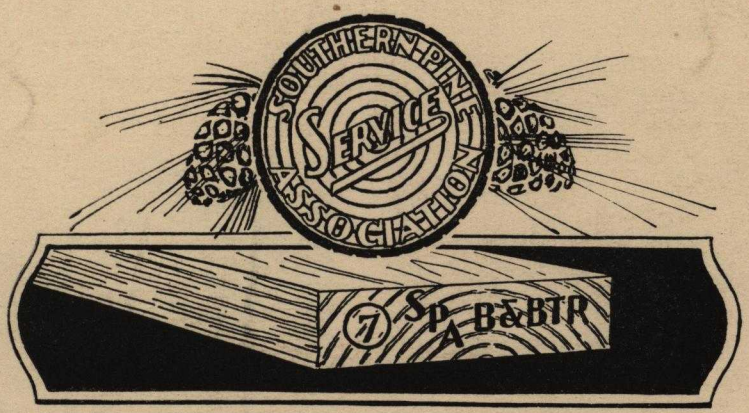
# ...AND NOW *Dry* LUMBER

***Another Progressive Step by Southern Pine Manufacturers***




## *Southern Pine Association*

NEW ORLEANS

194

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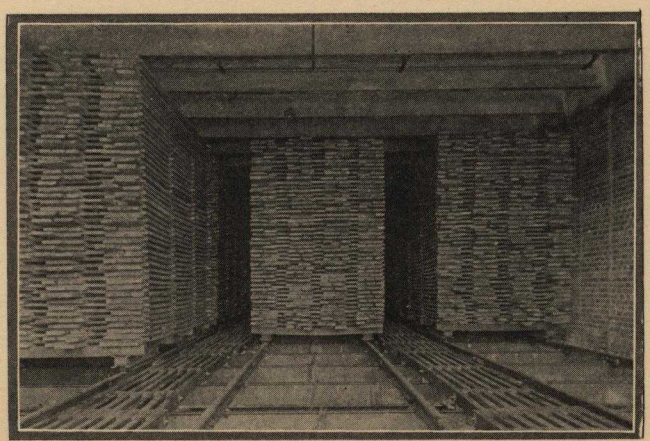
# ....And Now, Dry Lumber

## Another Progressive Step by Southern Pine Manufacturers

For years the principal aim of the producers of Southern Pine who subscribe to the Southern Pine Association has been to supply consumers with the particular grades and species of this lumber best suited to requirements in use.

With the perfection of grades and manufacture, accruing from careful supervision by expert Association inspectors, there remained but one barrier in the efforts of these progressive manufacturers of Southern Pine to furnish lumber users with an entirely satisfactory product. This barrier was the excessive moisture contained in much of the lumber purchased.

From the standpoint of efficiency in manufacture, economy in shipping, and for the conservation of the timber supply, the careful producer of Southern Pine has always endeavored to properly dry his product. This is particularly true of the mills subscribing to the Southern Pine Association. Too much Southern Pine, however, is produced by manufacturers not so careful, and it accordingly became necessary for the leaders in the industry, after long study and research, to incorporate in the standard grading rules for Southern Pine lumber, definite limitations in the way of maximums of moisture content permissible in the different grades and items.



Interior View of Dry Kiln

This bulletin has been prepared to acquaint the lumber salesman, the retail lumber dealer, the industrial user and the man who is about to put his life's earnings in the long wished for home, with the advantages of properly seasoned Southern Pine lumber and the assurance of satisfactory service offered by it. All Southern Pine lumber manufactured and graded in accordance with the Standard Specifications of the Southern Pine Association is now subject to these moisture limitations, and it is hoped that this bulletin will clarify the reasons for this most progressive step ever taken by the lumber industry.

### A SCIENTIFIC APPROACH

The new moisture specifications for Southern Pine lumber were not adopted without careful thought and study. Specifications prepared in a haphazard manner would have defeated the very purpose of the movement, for on the one hand the permissible moisture content might have been so high as to afford no protection to the user of Southern Pine, and on the other so low as to be impossible of attainment from a practical manufacturing standpoint.

As the United States Forest Service has carried on experiments for more than twenty years at the Forest Products Laboratory at Madison, Wisconsin, in the seasoning of wood, it was but natural that the Southern Pine Association should seek the counsel and aid of this experienced staff.

A study was conducted by engineers of the Forest Products Laboratory at twenty mills, representing both large and small producers of all species of Southern Pine. The purpose of the study was to ascertain what constituted the best drying practices, because the objective was to bring the whole industry up to this point of efficiency rather than have the entire product lowered to the level of the inefficient and careless shipper of green lumber.

After the results of the study were available, numerous meetings were held between the Forest Products Laboratory representatives and the subscribers and staff of the Southern Pine Association, resulting in the adoption, at the annual meeting of the Association at New Orleans in March, 1929, of definite moisture limitations in the various grades and items. This action was taken in the light of facts and in the sincere belief that every efficient manufacturer of Southern Pine can meet these moisture requirements.

## DRYING METHODS

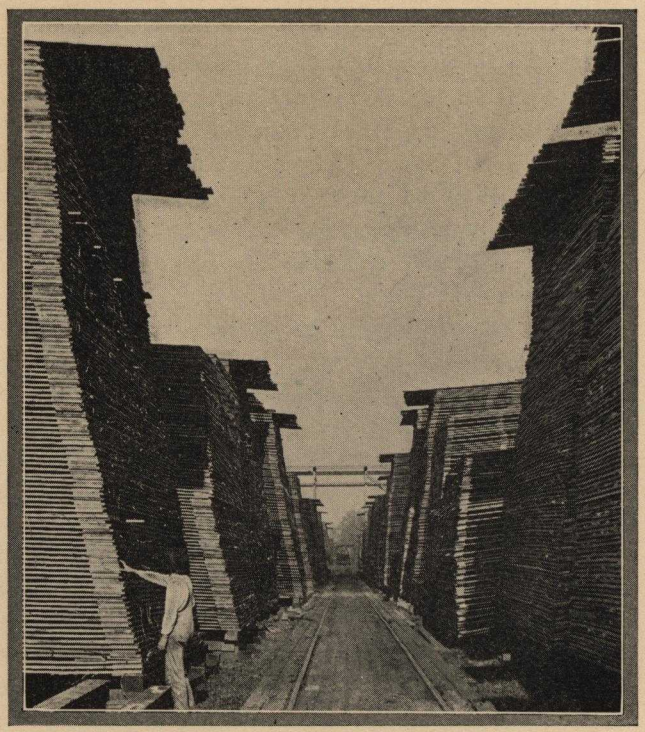
Very little thought is given by lumber users to the time and attention devoted by the careful manufacturer in nurturing the lumber coming green from the saw into a mature product suitable for use requirements.

Drying processes have kept in step with the times. There are, of course, fundamentally two methods of seasoning—one that is natural, and the other artificial, in the sense that aid is given to nature. The first of these is "air drying"—the second "kiln drying".

Since the first log was sawn, drying has been a primary subject for study by lumbermen. With the enormously growing demands of construction upon the lumber industry, there have arisen from time to time, problems of widely varying nature, most of which have been successfully solved by the lumber manufacturer. To the present day constant studies of both air drying and kiln drying of lumber are in progress, and, as new methods prove to be more efficient, they are put into practice.

In their effort to deliver a suitably dried product, Southern Pine manufacturers have expended and continue to expend large sums of money. Great stacks of lumber are piled with meticulous care in the open air in such a manner that proper natural circulation results. Under this influence excessive moisture in the lumber evaporates, each cubic foot of air which passes through and around the stack taking away its proportion. Days stretch into weeks and months, and finally the moisture content of the wood comes into equilibrium with that of the surrounding atmosphere, and the wood is said to be air dried. The rate of drying, of course, varies with the time of the year, species of wood, size and form of pieces, and method of piling. Certain of these factors may be controlled or utilized to hasten the drying process and lessen the likelihood of defects appearing in the material.

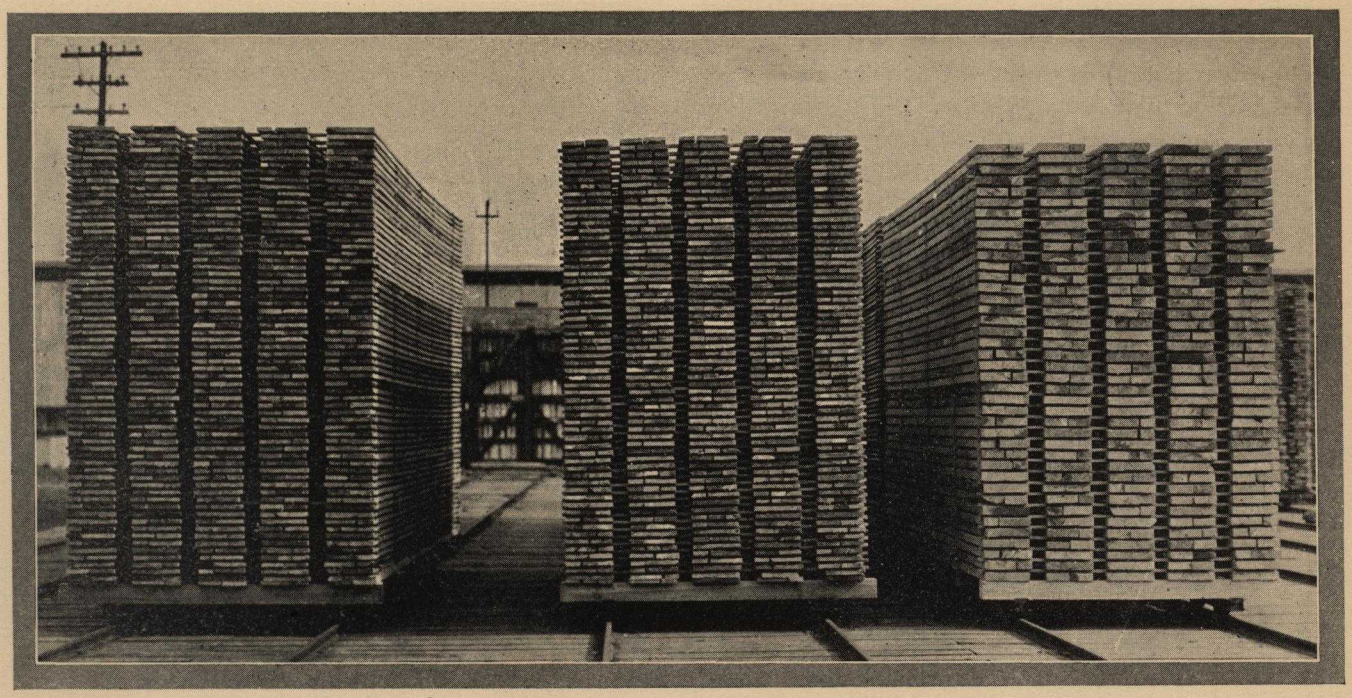
The artificial method of seasoning is known as "kiln drying". As the name implies it means the placement of lumber in a heated compartment for varying periods of time. The heat of smoke was once used to hasten the drying of lumber within enclosures, but today steam-heated atmosphere is forced about and through the stacks, with controls of humidity and temperature within the rooms. Much study has been given to this forced method of seasoning and it was only through years of



Looking down an alley in a Southern Pine mill's drying yard, with well-covered stacks of lumber being air-dried.

experimentation that present day efficiency was attained. Millions of dollars have been spent in arriving at this point, and Southern Pine mills, equipped as so many of them are, with the latest improved devices for the production of properly dried lumber, have led the way. The resultant product has been of untold benefit to the consumer.

These leaders have gone even further in their guarantee to the public through an official grademark that lumber shall be of the grade that is specified. They now offer a guarantee of maximum moisture content, assuring long years of satisfactory service to the ultimate consumer.



Illustrating the careful loading of kiln-cars at Southern Pine Mills; dimension is kiln-dried as the picture shows.

## PROTECTION TO THE BUYER

The lumber buyer, whether distributor or consumer, should understand why this product requires thorough seasoning and the benefits to be derived.

In the earlier days, the drying of lumber was hastened through the use of "smoke kilns", and it is interesting to learn that centuries before the Christian era, it was generally understood that through proper seasoning, the hardness and strength of lumber was materially increased. Hesiod, living about 735 B. C., remarked:

> "As the houses of the ancients were so smoky, it may be easily comprehended how, by means of smoke, they could dry and harden pieces of lumber."

The advantages of dry lumber were recognized by Virgil, that immortal Roman poet. Ten years or more spent in seclusion at his father's farm doubtless contributed to his writing:

> "Of beech the plough-tail; and the bending yoke
> Of stiffer linden hardened in the smoke."

Elsewhere he said:

> "These long suspend, where smoke their strength explores;
> And seasons into use and binds their pores."

The reason for drying or seasoning wood is to remove a certain amount of the water which is naturally present in its native state, and which if allowed to remain, interferes with its use for most purposes. The exact amount of drying depends upon the quantity of moisture present and the purpose for which the wood is to be used.

The principal reasons for seasoning or drying lumber are:

1. Dry wood is less subject to decay and attack by insects.
2. Dry lumber does not readily shrink, warp or check after being placed in use.
3. The weight of the wood is reduced through drying, cutting down the cost of transportation and handling.
4. Dry lumber is ready for painting or any other treatment.
5. Dry lumber is stronger, stiffer and harder.

All wood from the moment it is cut goes through a drying process. During this process defects such as splits, checks, loosening of knots or cups and crooks are produced in certain pieces. All or some of these defects are disallowed in certain grades. If the drying process takes place at the manufacturer's plant, the lumber is placed in its proper grade by reason of the defects. If the lumber goes through the drying process after having been shipped to the retail dealer or after having been placed into use, the degrade or the lowering of the grade by reason of the defects, is a loss suffered by the retailer or by the user.

It is logical, therefore, that the buyer should assure himself that his lumber has been properly seasoned by the manufacturer. If the lumber is not dry, the user must expect shrinkage, with con-

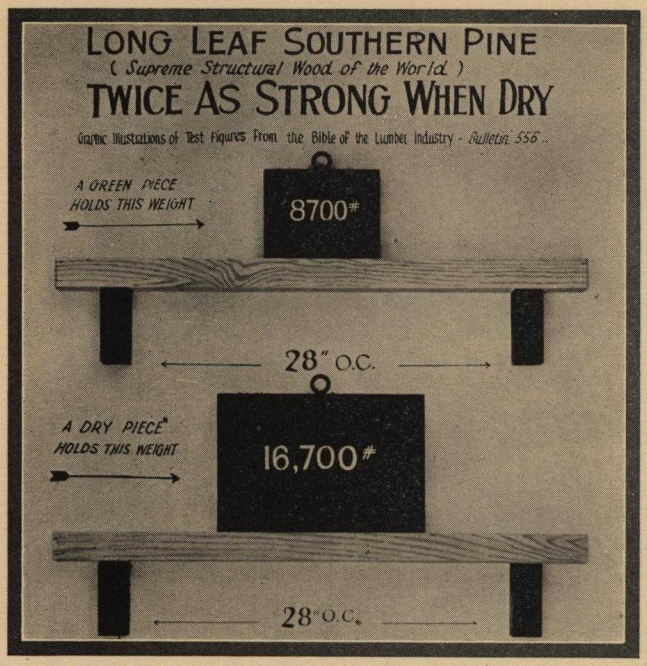
sequent warping, checking or misalignment. The new specifications of the Southern Pine Association protect the lumber buyer against excessive moisture in his lumber purchases. The buyer or specifier, whether he be contractor, engineer, architect, retailer or home builder is assured of satisfaction by requiring that his Southern Pine purchases be grade-marked. The grade-mark now stands not only for the grade, but for the moisture content as well.

## QUALITIES ADDED BY SEASONING

The qualities that are added to lumber as a result of proper seasoning are of tremendous importance, and yet it is surprising how few, even among those who daily specify and use lumber, realize this fact. Dry lumber is practically twice as strong as green lumber. At the same time, it is very much stiffer and harder. With but few exceptions strength is required in lumber items, and for every purpose, therefore, buyers should insist upon receiving a properly dried product.

Lumber which is thoroughly seasoned will not suffer from attacks by insects, nor will it prove fertile for the growth of dry rot. Decay spores and fungi are arrested by the long-time temperature in the dry kiln, or, if air seasoned, by the longer exposure in the air. Dryness of lumber is an absolute deterrent to rot.

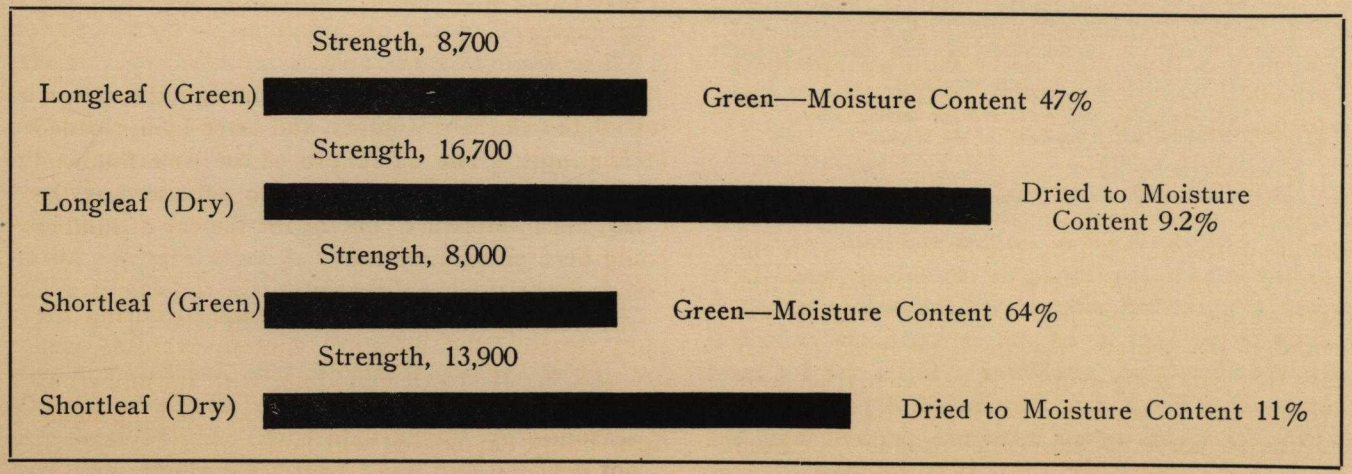
Since dry lumber will not shrink appreciably, it will not warp or cup, nor will it become crooked when placed into use. When properly dried lumber, for instance, is placed in a residential job, as sills, joists, plates or studs, there need be no fear of the misalignment of doors, or cracks in the corners of rooms, because little, if any, additional shrinkage will take place.

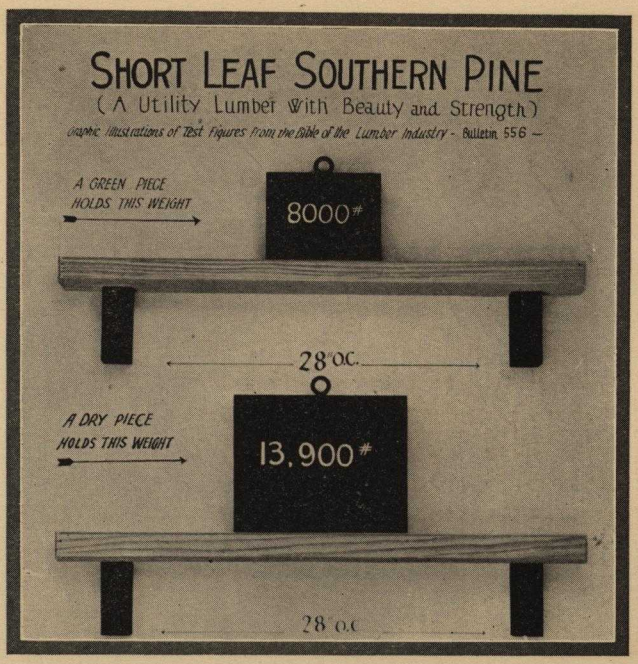

LONG LEAF SOUTHERN PINE
( Supreme Structural Wood of the World )
TWICE AS STRONG WHEN DRY
Graphic Illustrations of Test Figures From the Bible of the Lumber Industry - Bulletin 556
A GREEN PIECE HOLDS THIS WEIGHT
8700#
28" O.C.
A DRY PIECE HOLDS THIS WEIGHT
16,700#
28" O.C.

Diagrammatic chart which shows increased strength given to Long Leaf Pine when dried properly.

The squeaking of floors will be largely eliminated through the use of dry lumber as sub-flooring. Squeaks, of course, are never found in the surface floor. They are caused by the movement of nails in the sub-floor or joists. When lumber of too high a moisture content is used it shrinks away from the nails.

Since strength should always be considered in the purchase of lumber, attention is called to the chart shown below, which visualizes the increase in the strength of a piece of lumber when transformed from the green condition to the dry condition. The figures above each bar indicate the load which a clear piece 2"x2" withstood before breaking, and is taken from Bulletin 556 of the Forest Products Laboratory.




SHORT LEAF SOUTHERN PINE
(A Utility Lumber With Beauty and Strength)
Graphic Illustrations of Test Figures from the Bible of the Lumber Industry - Bulletin 556 —
A GREEN PIECE HOLDS THIS WEIGHT
8000#
28" O.C.
A DRY PIECE HOLDS THIS WEIGHT
13,900#
28" O.C.

Short Leaf Pine increases wonderfully in strength when dried to low moisture content.

## MOISTURE CONTENT CAN BE TOO LOW

It has been only during comparatively recent years that lumber specifiers, particularly in the industrial field, have been writing moisture content specifications into their inquiries or orders. Some of these buyers require a moisture content so low as not only to limit their source of supply, but to receive a product just as unsuitable for their purpose as if it contained excessive moisture.

Probably nothing has contributed to bringing about this situation more than the experience of the industrial users of Southern Pine who for a while may have specified 12% moisture content and obtained lumber entirely too wet for use. It was but natural that the next inquiry would call for 8% or 10% moisture content. A recurrence of experiences of this kind has caused many specifiers to gradually reduce moisture specifications to entirely too low a figure.

It is common knowledge that lumber that has been dried below a certain point will later pick up moisture until it reaches an equilibrium with the humidity of the atmosphere at the place where the lumber is used. This increase in moisture is not harmful if the lumber has not been dried too far below this balancing point. It can easily be seen, however, that if lumber too close to a bone dry condition is fabricated into other products, or used in building construction, its later absorption of moisture may result in defects as serious as those which accrue from the use of wet lumber.

Southern Pine manufacturers, particularly those subscribing to the Southern Pine Association, are now equipped to supply lumber of definite moisture content. Orders calling for moisture content of even lower degrees than those provided in the standard specifications can be fulfilled. Buyers may now safely specify the moisture content which they know their lumber requires in use.

## CHANGE IN TRANSIT

There is a popular impression that the moisture content of lumber undergoes a broad change during the time it is moving from the mill to destination. It is not generally realized that a carload of lumber, consisting of 20,000 board feet, would have to lose or gain 500 pounds of water in order to change in moisture content 1%. Aside from the mathematics thus expressed, the Forest Products Laboratory several years ago made a test of five cars shipped between January and April, the period representing the rainy season at the point of shipment. The cars were loaded with 1" Common Boards and each contained about 20,000 feet. Ordinary box cars were used. No attempt was made to select them, except that no leaky roofs or loose doors were permitted. The cars were not lined, nor were the doors sealed with waterproof paper.

Eighteen test pieces having the same moisture content as the lumber were placed in various parts of the car at the point of shipment. The lumber when shipped had a moisture content of about 8%. Upon the arrival of the cars at Chicago, the test pieces were again tested for moisture content, and it was found that the pick-up, or increase, in moisture content was less than 1/5 of 1%.

A further check was made through the weighing of the car when empty and after being loaded at the mill. The same procedure was followed upon the arrival of the car in Chicago, so that the total gain in moisture content for the car of lumber could be used as a check.

In a car of crown moulding shipped during the rainy season, the moisture content increase was 3/4 of 1%. If crown moulding, with its numerous air spaces as loaded in a car will not pick up moisture, surely flat boards will not.

## HOW ASSOCIATION IS HELPING

Southern Pine Association manufacturers are fully awake to the importance of this new step in lumber merchandising, and every effort is being made to improve drying and storage facilities.

Since the adoption of the moisture specifications, the Southern Pine Association has assigned one of its most competent inspectors to devote his exclusive attention to the supervision of kiln-drying and moisture content at its subscribing mills. This service enables the mills to have their kiln attendants properly supervised and trained in the fundamentals of drying. The mills likewise are shown how moisture determinations should be made and, through the experiences gathered by this inspector, there is made available to all of the subscribing mills the methods and practices producing the most satisfactory results.

The wealth of experience and knowledge of veteran members of the Southern Pine Association Inspection Department has been placed at the disposal of distributors and users of lumber in connection with the moisture specifications. Years of practical experience have ripened the judgment of these experts as to what constitutes dryness in lumber. They are equipped to make intelligent moisture determinations.

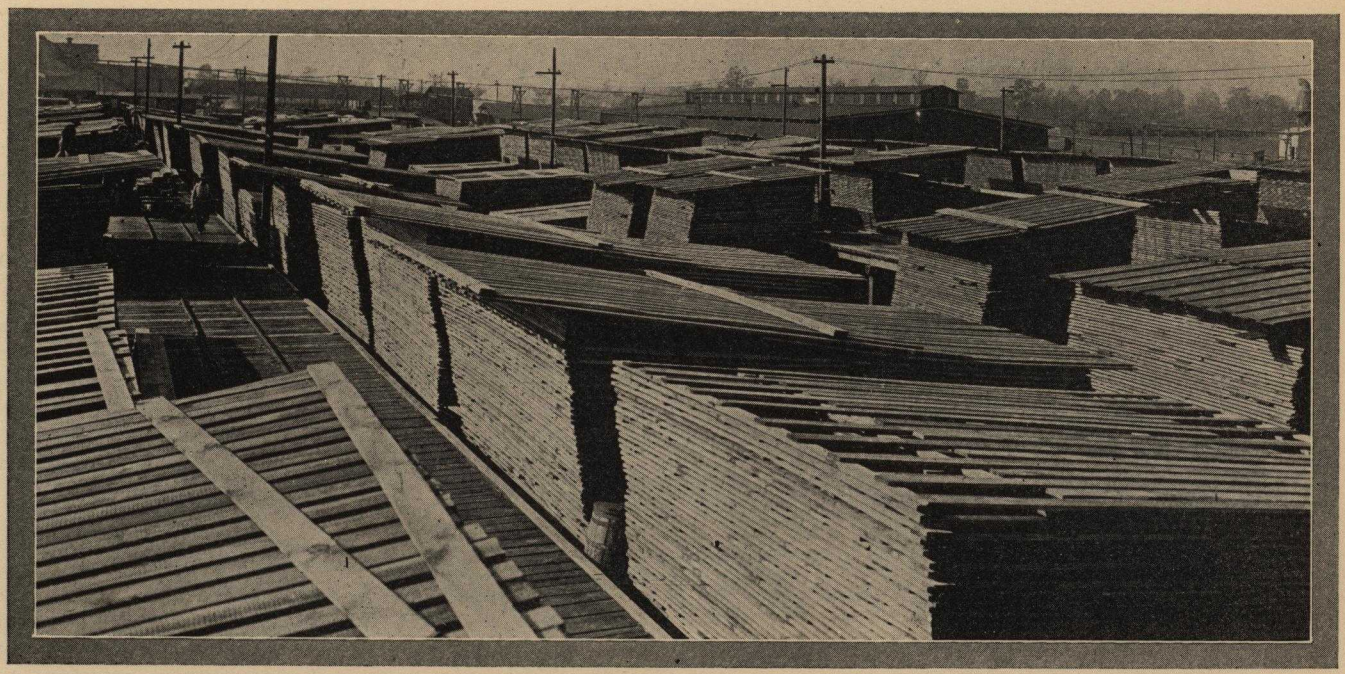
Whenever a shipment of Southern Pine is believed to be improperly dried, the purchaser may communicate with the mill with the assurance that a prompt inspection will be made.

## DISTRIBUTORS AND USERS CAN CO-OPERATE

Lumber is the only commodity used in construction to which such a small amount of protection and care is given. Lumber to be used for framing a house, for doors and window frames, sheathing and sub-flooring is unloaded at the job and in most cases is carelessly thrown into a pile and left exposed to the weather. Now that the manufacturer of Southern Pine is bending every effort to bring his product to a given condition of dryness and prepare it properly for its ultimate use, it is highly desirable that distributors and users exercise extreme care in preserving these qualities.

**Long battery of dry kilns in the background, with kiln-cars loaded with Southern Pine moving in. Great care is used in building such loads.**

It is not unusual to see an absolute lack of thought regarding the future of the structure into which lumber is going, and yet, the lumber retailer, contractor or builder will see that other materials are protected against the elements. Cement and plaster are carefully housed. Every precaution is taken to keep hardwood flooring from coming in



View of an immense yard at a Southern Pine mill, with vast amounts of lumber drying by the natural climatic process. The extent of lumber carried in stock may be realized.

contact with dampness. Protecting covers are placed over piles of brick and tile. But the item which is the skeleton of the structure—the item upon which the strength and stiffness and permanence of alignment depends—is forgotten and neglected.

Commodities other than lumber are subject to severe injury by poor treatment and carelessness. If care of one commodity is taken, care should be taken of all. Each is of importance in the structure. Lumber in all probability is the most important.

There is a decided tendency among retailers to increase their sheds in size and number for no other reason than to protect the lumber for the consumer's benefit. This is a practice which should be extended to all of the retail yards of the country.

In turn, the contractor or builder should properly care for the materials entering construction, for his duty to his client and his reputation as a builder, demands that materials which will give life-long satisfaction are placed in the structure.

The Southern Pine Association has taken the most advanced step in the lumber industry by setting up a standard for dryness. Manufacturers of Southern Pine are striving to give to the user the product he needs and desires. To accomplish this it is necessary for all who purchase or handle this product to do their part toward the same end. Properly seasoned Southern Pine is unexcelled in any use to which lumber is adapted. Buyers may now be assured of receiving not only the grade they need and pay for, but lumber properly dried for all purposes, by specifying S.P.A. grade-marked Southern Pine.

## THE NEW SPECIFICATIONS

Lumber distributors, as well as salesmen and consumers should familiarize themselves with the provisions that have been incorporated in the Standard Specifications for Southern Pine covering moisture content. They are:

### KILN DRIED

1. For C and Better Lumber—4/4 and 5/4—kiln dried, the moisture content shall not exceed 12% in 90% of the pieces of a shipment, or an item of a shipment, and the remainder shall not exceed 15%.

2. For C and Better Lumber—6/4 and 8/4—kiln dried, the moisture content shall not exceed 14% in 90% of the pieces of a shipment, or an item of a shipment, and the remainder shall not exceed 17%.

3. For No. 1, No. 2 and No. 3 Common Boards and Strips—kiln dried, the moisture content shall not exceed 15% in 90% of the pieces of a shipment, or an item of a shipment, and the remainder shall not exceed 18%.

4. For No. 1 and No. 2 Dimenion—kiln dried, the moisture content shall not exceed 15% in 90% of the pieces of a shipment, or an item of a shipment, and the remainder shall not exceed 18%.

## AIR DRIED

5. If, and when C and Better lumber 4/4 and 5/4 is air dried, the moisture content shall not exceed 16% in 90% of the pieces of a shipment, or an item of a shipment, and the remainder shall not exceed 19%.

6. If, and when C and Better lumber 6/4 and 8/4 is air dried, the moisture content shall not exceed 18% in 90% of the pieces of a shipment, or an item of a shipment, and the remainder shall not exceed 21%.

7. For No. 1, No. 2 and No. 3 Common Boards and Strips—air dried, the moisture content shall not exceed 19% in 90% of the pieces of a shipment, or an item of a shipment, and the remainder shall not exceed 22%.

8. For No. 1 and No. 2 Dimension—air dried—the moisture content shall not exceed 19% in 90% of the pieces of a shipment, or an item of a shipment, and the remainder shall not exceed 22%.

## INSPECTION AND SHIPPING

9. These moisture content provisions apply at the time of loading the lumber.

10. Purchasers desiring stock of a specific moisture content, higher or lower than the figures given herein, may obtain it by ordering it special, and such a shipment shall be considered not as having been manufactured under these rules, but as a special contract.

11. In case of complaint on account of the dryness of any shipment of Southern Pine lumber, official Association inspection will be available to subscribers and to non-subscribers upon request. Such inspections for dryness will be made in accordance with the maximums allowable under these rules; inspection service for "special" moisture content limitations shall be rendered only when the exact specifications are furnished to the inspector.

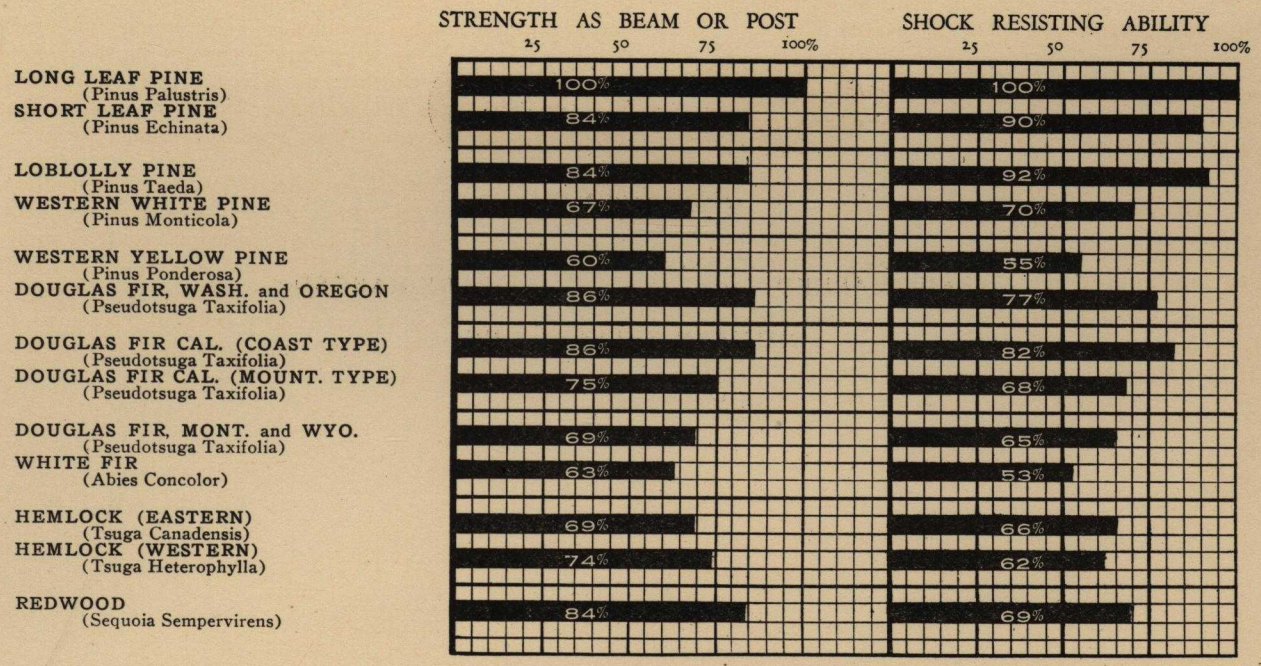
12. In case the buyer wishes inspection as to moisture content, he shall notify the shipper within twenty-four hours after the lumber is unloaded. All lumber on which complaint is made as to moisture content must be fully protected from the weather; no inspection will be made if, upon the arrival of the inspector, there is evidence that these provisions have not been strictly complied with.

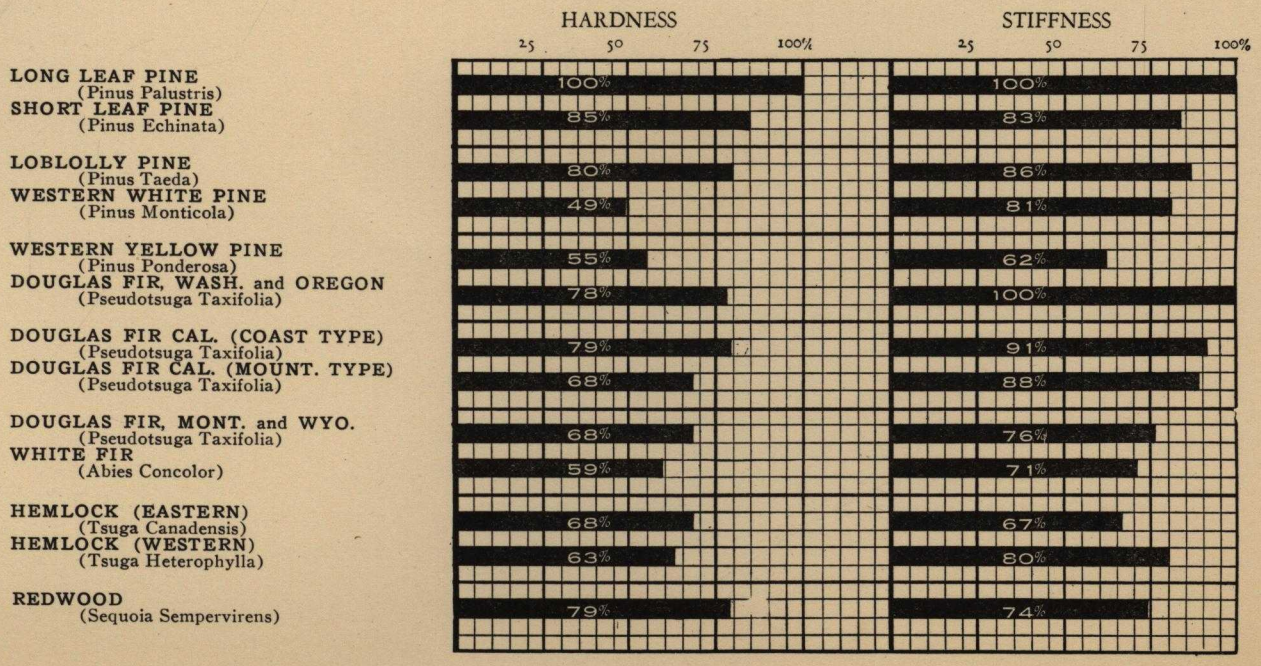
13. If, as a result of an official Association inspection, it should be found that some of the pieces of a shipment, or an item, exceed the maximum moisture content allowable herein, such pieces shall be considered as of the next lower grade. It is understood that an item of a shipment will consist of a grade and size, without reference to lengths, except in the case of Dimension that is ordered in quantities of specified lengths.

# COMPARATIVE VALUES of the SOUTHERN PINES and OTHER SOFTWOODS

The values from which these percentages were derived, were taken from United States Department of Agriculture Bulletin 556, entitled "Mechanical Properties of Woods Grown in the United States."

## Long Leaf Yellow Pine 100%


STRENGTH AS BEAM OR POST
SHOCK RESISTING ABILITY
25 50 75 100%
25 50 75 100%
LONG LEAF PINE (Pinus Palustris)
SHORT LEAF PINE (Pinus Echinata)
LOBLOLLY PINE (Pinus Taeda)
WESTERN WHITE PINE (Pinus Monticola)
WESTERN YELLOW PINE (Pinus Ponderosa)
DOUGLAS FIR, WASH. and OREGON (Pseudotsuga Taxifolia)
DOUGLAS FIR CAL. (COAST TYPE) (Pseudotsuga Taxifolia)
DOUGLAS FIR CAL. (MOUNT. TYPE) (Pseudotsuga Taxifolia)
DOUGLAS FIR, MONT. and WYO. (Pseudotsuga Taxifolia)
WHITE FIR (Abies Concolor)
HEMLOCK (EASTERN) (Tsuga Canadensis)
HEMLOCK (WESTERN) (Tsuga Heterophylla)
REDWOOD (Sequoia Sempervirens)
100% 84% 84% 67% 60% 86% 86% 75% 69% 63% 69% 74% 84%
100% 90% 92% 70% 55% 77% 82% 68% 65% 53% 66% 62% 69%


HARDNESS
STIFFNESS
25 50 75 100%
25 50 75 100%
LONG LEAF PINE (Pinus Palustris)
SHORT LEAF PINE (Pinus Echinata)
LOBLOLLY PINE (Pinus Taeda)
WESTERN WHITE PINE (Pinus Monticola)
WESTERN YELLOW PINE (Pinus Ponderosa)
DOUGLAS FIR, WASH. and OREGON (Pseudotsuga Taxifolia)
DOUGLAS FIR CAL. (COAST TYPE) (Pseudotsuga Taxifolia)
DOUGLAS FIR CAL. (MOUNT. TYPE) (Pseudotsuga Taxifolia)
DOUGLAS FIR, MONT. and WYO. (Pseudotsuga Taxifolia)
WHITE FIR (Abies Concolor)
HEMLOCK (EASTERN) (Tsuga Canadensis)
HEMLOCK (WESTERN) (Tsuga Heterophylla)
REDWOOD (Sequoia Sempervirens)
100% 85% 80% 49% 55% 78% 79% 68% 68% 59% 68% 63% 79%
100% 83% 86% 81% 62% 100% 91% 88% 76% 71% 67% 80% 74%

TRADE-MARKED GRADE-MARKED

SOUTHERN YELLOW PINE